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NASA TECH BRIEF

NASA Headquarters

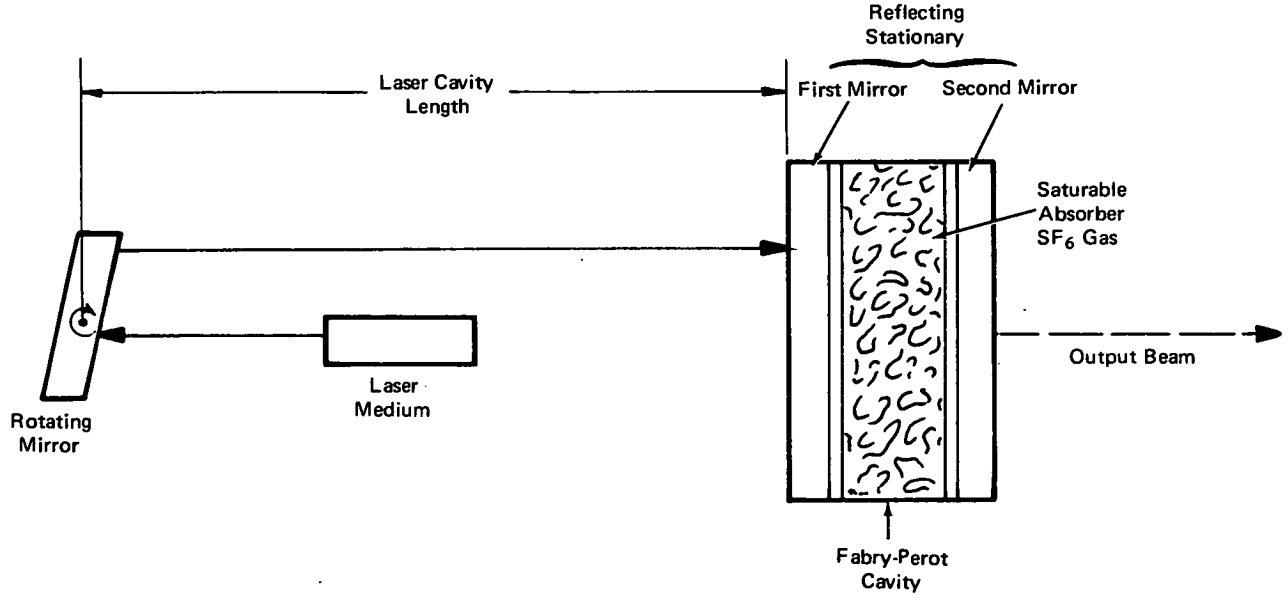
A Bi-Stable Optical Device

The problem:

Short optical (laser) pulses produced by Q switching or mode locking are difficult to change or control.

The solution:

A device has been developed which produces short optical pulses of variable lengths with high peak power and without the use of external modulators or independent light beams.



How it's done:

Short optical pulses of variable length may be generated by a light-switching technique which uses the apparatus shown in the diagram. The optical field intensity is built up inside the cavity. At the peak of its intensity, the light is switched off.

Typically, the laser might be a CO_2 gas laser operating on the 10.6-μm wavelength with SF_6 gas as the saturable absorber in the cavity at a pressure of 1 Torr. The first mirror of the Fabry-Perot cavity acts as the stationary mirror of the laser cavity. The laser medium is pumped and Q-switching is initiated by the rotating mirror. When the intensity of the input current in the laser medium builds up to a specified value, there is a sudden transmission through the cavity and a pulse is produced at the output with a physical length of twice the laser cavity length. This length is equal to the distance between the rotating mirror and the reflecting mirror of the cavity. Therefore, by controlling the length of the laser cavity, an easy method of producing optical pulses of variable length is obtained without the use of expensive external modulators. This was difficult to accomplish by the prior Q-switching art due to the dependence of pulse width on laser gain, loss, pumping rate, and mirror reflectivity.

(continued overleaf)

Note:

Requests for further information may be directed to:
Technology Utilization Officer
NASA Headquarters
Code KT
Washington, D. C. 20546
Reference: TSP72-10655

Patent status:

NASA has decided not to apply for a patent.

Source: A. Szoke of
Massachusetts Institute of Technology
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NASA Headquarters
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